CRS Report for Congress

Evolutionary Acquisition and Spiral Development in DOD Programs: Policy Issues for Congress

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Summary

Evolutionary acquisition with spiral development (EA/SD) is a new approach for developing major weapon systems that the Department of Defense (DOD) has adopted as its "preferred" standard. EA/SD is intended to make DOD's acquisition system more responsive to rapid changes in military needs. A November 2003 GAO report assesses DOD's policies and regulations for implementing EA/SD and makes some recommendations for strengthening them. EA/SD poses potentially important challenges for Congress in carrying out its legislative functions, particularly committing to and effectively overseeing DOD weapon acquisition programs. This report will be updated as events warrant.

Background

Origin and Aims of EA/SD. DOD has introduced a new approach for developing new weapon systems called evolutionary acquisition with spiral development (EA/SD), which it has adopted as its "preferred" standard. EA/SD, which is referred to informally (though not entirely accurately) as spiral development, is an outgrowth of the defense acquisition reform movement of the 1990s, and is part of DOD's effort to make its acquisition system more responsive to rapid changes in threats, technology, and warfighter needs. It is also intended to increase DOD's control over program costs, DOD program-manager accountability, and participation of high-tech firms in DOD weapon acquisition programs. DOD's goals in using EA/SD are to:

- get useful increments of new capability into the hands of U.S. personnel more quickly;
- take better advantage of user feedback in refining system requirements and developing subsequent increments of capability;
- mitigate technical development risk in weapon programs that are to employ new or emerging technologies; and

Report Documentation Page

1. REPORT DATE **08 APR 2004**	2. REPORT TYPE **N/A**	3. DATES COVERED **-**	
4. TITLE AND SUBTITLE **Evolutionary Acquisition and Spiral Development in DOD Programs: Policy Issues for Congress**		5a. CONTRACT NUMBER	
		5b. GRANT NUMBER	
		5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)		5d. PROJECT NUMBER	
		5e. TASK NUMBER	
		5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **David D. Acker Library and Knowledge Repository Defense Acquisition University Fort Belvoir, VA**		8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)	
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT **Approved for public release, distribution unlimited**			
13. SUPPLEMENTARY NOTES			
14. ABSTRACT			
15. SUBJECT TERMS			

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT **UU**	18. NUMBER OF PAGES **6**	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**			

- facilitate the periodic injection of new technology into weapons over their life cycles, so as to better keep pace with technological changes.

Description of EA/SD. Under DOD's traditional weapon acquisition method, now known as single step to full capability (SSFC), DOD would first define a specific performance requirement to be met, and then work, usually for a period of more than 10 years in the case of a complex weapon system like an aircraft or ship, to develop and build a design that, upon first deployment, was intended to meet 100% of that requirement. The core idea of EA/SD is to set aside the quest for 100% fulfillment of the requirement in the initial version of the weapon and instead rapidly develop an initial version that meets some fraction (for example, 50% to 60%) of the requirement. Field experience with this initial version is then be used to develop later versions, or blocks, of the weapon that meet an increasing fraction of the requirement, until a version is eventually developed that meets the 100% standard.

Figure 1 below details the process for each block. Each block includes four phases for conceiving, developing, producing, and sustaining (i.e., supporting) a weapon system. Each phase is governed by certain acquisition rules and regulations, including entrance and exit criteria, and is subject to the requirements process, including the Initial Capabilities Document (ICD) and Capability Development Document (CDD). Each block includes its own acquisition contracts and fully funded budgets for a defined time period.

Figure 1. The 5000 Acquisition Model Utilizing Evolutionary Acquisition and Spiral Development

BLOCK PARADIGM
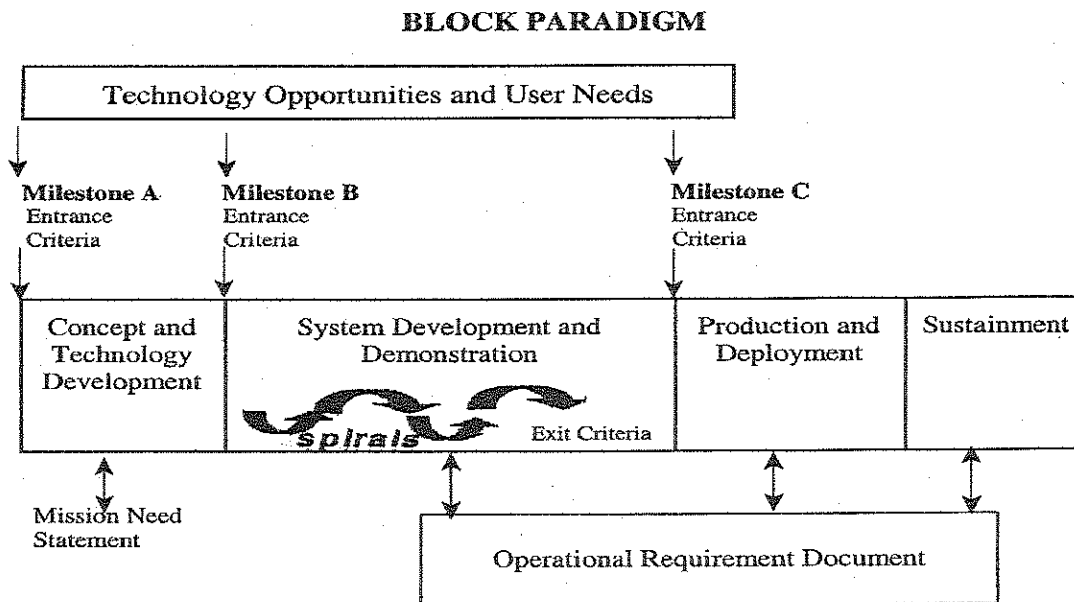
As shown in Figure 1, spiral development occurs as the second phase *within a block*. Spiral development is an iterative process for developing a weapon system's capabilities in which the developer, tester, and user to interact with one another so as refine (i.e., spiral down to a specific understanding of) the system's operational requirements. Spiral interaction can change the course of a system's technology development.

Although EA/SD differs from SSFC in its use of block development from the outset of a program, from a program-management perspective, EA/SD is similar in some areas

to SSFC, including the development milestones and reviews that are used at each development stage. EA/SD, however, is intended to be more flexible than traditional development in terms of permitting changes in a program's requirements or development path resulting from changes in threats, technology, or warfighter needs. EA/SD is also intended to be more flexible than traditional development regarding entry points into the acquisition process. Under DOD's traditional approach, the dominant entry point is the beginning. Under EA/SD, in contrast, programs can enter various phases of any block (A, B, or C in Figure 1), depending on the maturity of the program.

Under EA/SD, the final desired capability of the system can be determined in two ways — at the beginning of the program, with the content of each deployable block determined by well-understood (i.e., mature) key technologies, or along the way, with the content of each block determined by success or failure in developing less-well-understood (i.e., emerging) technologies or the evolving needs of the military user. Applying EA/SD at the outset of large weapon acquisition programs, such as the ballistic missile defense program, can create significant initial uncertainty regarding the design and ultimate cost of the systems that will eventually be procured under the program, the number of systems to be procured, and the schedule for procuring them. Applying EA/SD to other programs, particularly those intended to develop more up-to-date subsystems for improving existing weapons such as the F-16 fighter or M-1 tank, can produce much less uncertainty regarding the program's ultimate outcome.

Programs Using EA/SD. Although DOD has used EA/SD for years on a somewhat limited basis, DOD decided in 2001 that EA/SD would henceforth be the "preferred" (i.e., standard or default) acquisition strategy for all types of weapon acquisition programs — newly initiated programs, existing programs for developing new weapons, and programs for upgrading weapons already in existence. EA/SD was elevated in prominence that year when DOD announced that it was applying EA/SD to its ballistic missile defense program[1] and that the Navy's new DD(X) family of surface combatants program would be an EA/SD program.[2]

Examples of programs now using EA/SD include: in phase A (see Figure 1), the airborne laser, the DD(X) destroyer, and the Littoral Combat Ship (LCS); in phase B, the joint direct attack munition and an F-16 upgrade; and in phase C, procurement of modified commercial Boeing 747 and of DC-9 aircraft. The ballistic missile defense program is a more complex case because it includes multiple weapon systems, some existing and some in initial development, in different phases and blocks of development. In addition, although the ballistic missile defense program has embraced most of the EA/SD model (notably, the possible absence of ultimate cost and timeline projections), it differs from other programs being pursued under EA/SD because it operates under different oversight rules instituted in January 2002 by Defense Secretary Rumsfeld.

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[1] Statement of Lt. Gen. Ronald T. Kadish, USAF, Director, Ballistic Missile Defense Organization, on The Ballistic Missile Defense Program, Amended FY 2002 Budget, Before the Senate Armed Services Committee, July 12, 2001, pages 2-3, 6-8, 14. See also CRS Report RL31111, *Missile Defense: The Current Debate*, coordinated by Steven A. Hildreth and Amy F. Woolf. Washington, 2003. (Updated periodically)

[2] See CRS Report RL32109, *Navy DD(X) and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke. Washington, 2004. (Updated periodically)

GAO Report. A November 2003 General Accounting Office (GAO) report on EA/SD prepared at the direction of the Senate Armed Services Committee (see Legislative Activity section below) concluded the following:

> DOD has made major improvements to its acquisition policy by adopting knowledge-based, evolutionary practices used by successful commercial companies. If properly applied, these best practices can put DOD's decision makers in a better position to deliver high-quality products on time and within budget....
>
> The next step is for DOD to provide the necessary controls to ensure a knowledge-based, evolutionary approach is followed. For example, the policy does not establish measures to gauge design and manufacturing knowledge at critical junctures in the product development process. Without specific requirements to demonstrate knowledge at key points, the policy allows significant unknowns to be judged as acceptable risks, leaving an opening for decision makers to make uninformed decisions about continuing product development.
>
> DOD was responsive to the requirements in the Defense Authorization Act for Fiscal Year 2003 [see Legislative Activity section below]....
>
> This [GAO] report makes recommendations that the Secretary of Defense strengthen DOD's acquisition policy by requiring additional controls to ensure decision makers will follow a knowledge-based, evolutionary approach. DOD partially concurred with our recommendations. DOD believes the current acquisition framework includes the controls necessary to achieve effective results, but department officials will continue to monitor the process to determine whether other controls are needed to achieve the best possible outcomes. DOD agreed it should record and justify program decisions for moving from one stage of development to next but did not agree with the need to issue a report outside of the department.[3]

Issues for Congress

EA/SD poses potential issues for Congress regarding DOD and congressional oversight of weapon acquisition programs. To some degree, these issues appear to arise out of uncertainty over how EA/SD differs from the traditional weapon acquisition process. In part, however, these issues appear to arise out of the features of EA/SD itself.

DOD Acquisition Policy and Oversight. One issue for Congress, addressed in the GAO report, is whether DOD has established adequate rules and regulations for conducting internal oversight of EA/SD programs. Some observers have expressed concern about this issue, particularly with regard to the spiral development phases of programs. In support of this concern, they have cited budget justification documents for the ballistic missile program, which have included some references to block development but have provided incomplete information on how much funding is spent for specific blocks, over what period of time, and on what progress has been made to date in each block. Supporters of EA/SD argue that DOD is fully aware of the need for adequate

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[3] U.S. General Accounting Office. *Defense Acquisitions[:] DOD's Revised Policy Emphasizes Best Practices, but More Controls Are Needed.* Washington, 2003. (November 2003, GAO-04-53) p. 2-3.

oversight and will take steps to ensure that it is provided. Potential questions for Congress include:

- How will DOD oversight for EA/SD programs compare to DOD oversight of traditional weapon acquisition programs in terms of frequency and nature of reviews, information required to be submitted to reviewing authorities, and evaluation and reporting by reviewing authorities?
- Will DOD oversight procedures, and review bodies be the same for all EA/SD programs, or will they vary from program to program?

Congressional Program Commitment and Oversight. Another issue for Congress is how to carry out its responsibility to allocate defense spending. EA/SD poses potentially significant issues for congressional oversight, particularly for newly initiated weapon acquisition programs, in three areas:

- **Ambiguous initial program description.** Programs initiated under EA/SD may not be well defined at the outset in terms of system design, quantities to be procured, development and procurement costs, and program schedule. These are key program characteristics that Congress in the past has wanted to understand in some detail before deciding whether to approve the start of a new weapon acquisition program. EA/SD can thus put Congress in the position of deciding whether to approve the start of a new a program with less information than it has had in the past.
- **Lack of well-defined benchmarks.** A corollary to the above is that Congress may not, years later, have well-defined initial program benchmarks against which to measure the performance of the military service managing the program or the contractor.
- **Funding projections potentially more volatile.** Although projections of future funding requirements for weapons acquisition programs are subject to change for various reasons, funding projections for EA/SD programs may be subject to even greater volatility due to each program's inherent potential for repeated refinements in performance requirements or technical approaches. As a result, any long-range projections of future funding requirements for EA/SD programs may be even less reliable than projections for systems pursued under the traditional DOD acquisition approach.

Supporters of EA/SD argue that it can improve congressional oversight of DOD weapon acquisition programs because the information that DOD provides for a given program will focus on the specific block that is proposed for development over the next few years. This information, they argue, will be more reliable — and thus better for Congress to use in conducting its oversight role — than the kind of long-range information that used to be provided under the traditional DOD acquisition approach.

Under the traditional approach, DOD provided information about the entire projected program, stretching many years into the future. Such information, supporters of EA/SD argue, may appear more complete, but is not very reliable because it requires projecting program-related events well into the future. DOD's history in accurately projecting such events, they argue, is far from perfect. As a result, they argue, information provided in connection with a traditional weapon acquisition program can give Congress the illusion

— but not the reality — of understanding the outlines of the entire program. On the other hand, critics of EA/SD contend that it has the potential for drawing Congress into programs to a point where extrication becomes difficult if not impossible, and without a clear idea of a program's ultimate objectives.

Potential questions for Congress and DOD regarding congressional oversight of EA/SD programs include the following:

- What might be the impact, on congressional approval of new weapon acquisition programs and subsequent congressional oversight of those programs, of having limited initial detail in terms of system design, quantities to be procured, procurement schedules, and total costs?
- How might congressional oversight of weapon development programs be affected if program information with longer time horizons but potentially less reliability is exchanged for program information with potentially greater short-term reliability — but, without previously available, if imperfect, estimates of full program costs?
- To what extent might DOD's new preference for EA/SD be influenced, as some critics contend, by the knowledge that it might relieve DOD of the responsibility for providing specific answers to congressional questions regarding system architecture, effectiveness, time lines, long-term strategic implications and cost?

Legislative Activity

FY2003 Defense Authorization Act (P.L. 107-314, H.R. 4546). Section 802 of the conference report (H.Rept. 107-772 of November 12, 2002) on the FY2003 defense authorization act (P.L. 107-314/H.R. 4546) requires DOD to report to Congress by early March 2003 on how DOD plans to apply to EA/SD programs certain statutory and regulatory requirements for major DOD acquisition programs. Section 803 sets forth certain conditions that have to be met before a DOD acquisition program can be pursued as an EA/SD effort, and requires DOD provide annual status reports for the next five years on each research and development program being pursued under EA/SD. Section 132 requires the Air Force to submit to Congress a list of programs that it has designated as acquisition reform "pathfinder programs," sets forth conditions under which those programs can proceed, and applies to them the requirement for filing status reports established under Section 803. These provisions are also discussed on pages 455-456 and 667-668 of the report. The Senate Armed Services Committee, in its report (S.Rept. 107-151 of May 15 [legislative day, May 9], 2002) on the FY2003 defense authorization bill (S. 2514), included similar provisions and commented extensively on the EA/SD process (see pages 94 and 333-335).

FY2004 Defense Authorization Bill (H.R. 1588/S. 1050). In its report (S.Rept. 108-46 of May 13, 2003) on S. 1050, the Senate Armed Services Committee expressed support for the concept of incremental acquisition and directed GAO "to assess current acquisition policies and regulations and to determine whether: (1) the policies support knowledge-based, evolutionary acquisitions; (2) the regulations enforcing these policies provide the necessary controls to ensure the Department's intent is followed; and (3) the policies are responsive to concerns expressed by the committee in the Bob Stump National Defense Authorization Act for Fiscal Year 2003." (Page 346) As discussed above, GAO submitted the required report in November 2003.